EICO MODEL 320
SIGNAL GENERATOR

The EICO Model 320 Signal Generator utilizes a highly stable Hartley oscillator circuit in the R.F. section. The audio oscillator is of the Colpitts type giving excellent sine wave output. The signal generator has been carefully designed for usefulness and desirability. It will become one of your most necessary tools in the alignment and testing of radio and audio circuits. It will also be useful as a "pip" marker in television alignment applications.

ASSEMBLY INSTRUCTIONS

The assembly of the Model 320 Signal Generator is not difficult and if care is used, no trouble should be encountered. First unpack all the parts checking them against the parts list, identifying each one to make sure no parts are thrown away with the packing.

The standard manufacturers values may be interchangeable. We are forced to order from several sources in order to assure the supply of these kits. You may, therefore, find that a value may vary within the permissible circuit tolerance, e.g., a resistance of 68K may be substituted for a 65K or may measure 63K, etc. All parts supplied will work just as well as the part for which it is substituted. Most parts have a tolerance rating of 20% and the circuit is designed to take these variations into account.

The tools needed for the work are a cleaned and tinned soldering iron, screwdrivers, pliers, and side cutters. Use a good grade of rosin core solder. DO NOT use acid core solder or flux. When making solder connections, wrap the wire securely around the joint and then solder, making sure solder flows into the joint.

Before starting the actual construction, study the schematic and pictorial wiring diagrams thoroughly, getting all the steps clear in your mind. Do not rush the assembly. Care will pay dividends. When the signal generator is completed, it represents a fine piece of test equipment. Most troubles in building kits can be traced to wrong connections or reversed parts and poor soldering.

ASSEMBLY PROCEDURE

Assemble the kit in the sequence given by the assembly prints. Follow the steps given on the assembly prints, checking off each step as you go along. The numbered parts such as #7 represent components given on the parts list. The circled numbers such as ⑧ represent soldered connections shown on the assembly prints. Each solder connection point has a different circled number.

Starting with assembly print No. 1, mount the main components on the main chassis. Wire the coupling condensers into the connectors using spaghetti tubing to prevent shorts as indicated in the cutaway view. In wiring the shielded coaxial cable lead, the cable connector and alligator clips should be attached to the ends of the coaxial cable supplied as shown in the cutaway drawing, making sure that the center lead is never shorted to the shielding. Strip the rubber covering from the shield at the ends of the cable.

Next go on to assembly print No. 2 for the power transformer wiring. After completing all the steps on print No. 2, go on to assembly print No. 3 which completes the main chassis wiring. Be sure to watch the polarity of the electrolytic condenser.

Now assemble the subchassis as given on print No. 4. Use extreme care in Handling, Assembling and Soldering the Coils and tuning condenser. The calibration and stability of the instrument are critically dependent upon these parts. The leads carrying R.F. should be of stiff bare wire. Use extreme care with the soldering iron in soldering the coils. In soldering to the rotary switch do not allow rosin from solder to flow into the contacts as this will cause erratic operation. A good mechanical joint should be made before solder is applied.

Mount the tuning condenser on the subchassis together with a lock washer and a ground lug on the opposite side of the subchassis. The ground lug serves as a common ground connection for all the R.F. coils. After completing the wiring on the subchassis, mount the subchassis on the main chassis as shown in Assembly print No. 5. Wire in the leads to the 6SN7 tube socket. Make sure that no R.F. leads are shorting to either chassis.

CHECKING THE OPERATION

Before plugging into the line, measure the resistance from B+ to ground (Pin 8 - 6X5 tube to ground). This should be infinite resistance, in other words, open circuit. Insert the tubes and connect to 110 V.AC. Turn the unit on and allow a minute for the tubes to heat up. On a broadcast receiver tune in a broadcast station. Connect the coaxial cable to the R.F. output jack and turn the R.F. attenuator for maximum output. Connect the output through a small capacity (200 MMFD.) to the receiver antenna terminal or near the antenna loop or coil. The cable shield should be connected to the ground of the receiver.

With the tuning condenser plates fully meshed (closed), place the knob with the pointer on the tuning condenser shaft so that the hairline falls on the beginning of the scales just below the 150KC mark and tighten the knob screws.

Turn the band switch to the proper band and tune the indicator knob around the frequency of the broadcast station tuned to until a whistle is heard. Then proceed with the calibration.

IN CASE OF TROUBLE

1. Check wiring carefully to see nothing has been omitted or wired wrong.

2. Check tubes.

3. Check all parts and resistors to see that they have been place in their proper places.

4. Trace out entire wiring using a colored pencil over the wiring diagram.

5. If you still cannot find the trouble write our engineering department giving all information which may be helpful. We will gladly try to help you find the trouble.

6. If desired, you may return the instrument to the factory where it will be put into operating condition for a charge of $5.00 plus any parts or alterations required due to damaged construction. Ship with tubes packed separately. WARNING! Pack unit well and ship prepaid Railway Express. Instrument will be returned express collect.

CALIBRATION

The indicator knob should be attached so that with the tuning condenser plates fully meshed (closed), the hairline falls at the beginning of the scales, just below the 150 KC. mark.

The output of the signal generator should be connected as described above.

Tune in a broadcast station of known frequency at about 700 KC. on the broadcast receiver.

With the band selector knob turned to the proper band, turn the indicator knob about the corresponding frequency calibration on the signal generator until a beat whistle is heard in the receiver. The lowest pitch whistle or zero beat indicates that the signal generator and station are on the exact same frequency.

Then turn the indicator knob to the calibration mark on the signal generator corresponding to the exact broadcast station frequency.

Then with a screwdriver, turn the calibration air trimmer located on the tuning assembly chassis behind the front panel, about until the beat whistle is obtained and zero beat is obtained. Then the signal generator frequency will be exactly the same as the broadcast station frequency and the signal generator calibrations will be correct.

The air trimmer should be nearly unmeshed (little capacity). If the trimmer must be opened all the way (smallest capacity), there is an excessive amount of distributed capacity due to wiring in the tuning circuits. Make sure all leads from the top of the coils to the switch and from the switch to the tuning condenser and trimmer are at least 1/4 inch away from the metal chassis and all other wiring.

ACCURACY

The accuracy of the signal generator is sufficient for receiver alignment. Peaking the receiver for maximum is critical and requires care in order to obtain good alignment.

If it is desired to calibrate a receiver or other equipment with great accuracy the following procedure should be used. Allow some time for the generator to warm up. Make a rough calibration with the signal generator. Then with a short wave receiver tune in WWV (Bureau of standards at 2.5, 5 or 10 MC.). Set the signal generator to a suitable subharmonic such as 500 KC. and adjust for zero beat. Now the harmonics of the signal generator occur, very accurately at every 500 KC, such as 500 KC., 1000 KC., 2000 KC., etc. These points may be used to correct the rough calibration which is used merely to distinguish between the many harmonics available. For calibrating higher frequency equipment, using a high frequency subharmonic on the signal generator such as 5 or 10 MC. will reduce the confusion between the multitude of harmonics falling over the high frequency range and also provide adequate signal strength.

When checking the accuracy of the signal generator, the most convenient standards of comparison, of sufficient accuracy are broadcast stations of known frequency. Crystal oscillators of standard frequency are also sufficient. Receiver dial calibration are frequently not of sufficient accuracy for this purpose.

USES FOR THE SIGNAL GENERATOR

The signal generator is used to align radio receivers. It is a variable source of R.F. waves modulated or unmodulated, from 150 KC. to 34 MC., with strong useful calibrated harmonics to over 100 MC.

A source of 400 cycle sine wave audio voltage is also available. The maximum output is about 4.2 volts. Thus the signal generator also provides a useful source of audio frequency voltage for testing amplifiers and other audio equipment.

ALIGNING RECEIVERS

The best alignment procedure to follow is that given by the manufacturer of the receiver being aligned. General instructions are given below.

Connect the signal generator output lead to the signal grid of the converter tube (this point is usually the variable condenser stator section). Connect shield of output cable to chassis of receiver.

Adjust the signal generator to the I.F. frequency (usually 455KC.) and adjust the I.F. transformer trimmer condensers for peak output, at the same time reducing the output of the signal generator.

The Oscillator of the receiver is aligned by setting the signal generator to 1600 KC., setting the receiver dial to the same frequency. The oscillator trimmer is then adjusted for maximum output.

The RF is aligned by setting the receiver and signal generator to 1400 KC., connecting the latter through a 200 MMFD condenser. The shield of the signal generator cable is attached to receiver B- and the R.F. trimmers adjusted for maximum response.

For a receiver with loop antenna the signal generator can be coupled to the loop using a single turn of wire around the loop.

TESTING FOR DISTORTION IN AUDIO AMPLIFIERS

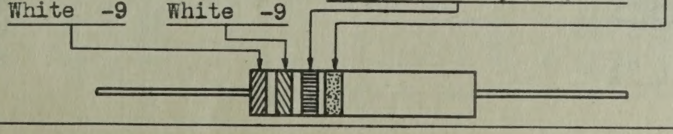
In order to test for distortion in an audio amplifier, an oscilloscope is necessary in conjunction with the audio output of the signal generator. The output waveform from the signal generator is a pure sine wave as can be seen by viewing the output on an oscilloscope. If the audio output of the signal generator is fed to an audio amplifier and the output viewed on an oscilloscope, any distortion occurring in the amplifier can be seen. Waveforms with clipped peaks indicate overloading or incorrect bias on the tubes. Thus certain types of distortion which the ear cannot readily detect can be discovered by this method.

PARTS LIST - MODEL 320

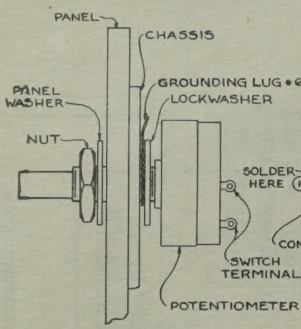
1.	Main chassis	1
2.	Sub-chassis for tuning assembly	1
3.	Panel	1
4.	Cabinet	1
5.	Handle	1
6.	Power transformer	1
7.	50 MMFD. mica R.F. grid condenser	1
8.	.002 MFD., R.F. plate bypass condenser	1
9.	.05 MFD. audio grid leak condenser	1
10.	.25 MFD. audio plate condenser	1
11.	.50 MFD. audio grid condenser	1
12.	.01 MFD. output coupling condenser (miniature)	2
13.	Female connector	1
14.	16 MFD. electrolytic filter condenser	1
15.	.1 MFD. power line bypass condenser	1
16.	Alligator clips	2
17.	50 MMFD. air trimmer (ceramic insulation)	1
18.	360 MMFD. tuning condenser	1
19.	100K - ½ WATT R.F. grid leak resistor	1
20.	5600 OHM - 1 WATT plate resistor	1
21.	65K - ½ WATT audio grid leak resistor	1
22.	20 OHMS - ½ WATT audio cathode resistor	1
23.	10K - ½ WATT R.F. cathode resistor	1
24.	0-10K potentiometer with SPST switch	1
25.	0-500K potentiometer with SPST switch	1
26.	2700 OHMS - ½ WATT	1
27.	5000 OHMS - 1 WATT Filter resistor	1
28.	6SN7 Tube	1
29.	6X5 Tube	1
30.	Rotary switch - 5 Position 2 sections	1
31.	L1 - Band A Coil - Red dot	1
32.	L2 - Band B Coil - Blue dot	1
33.	L3 - Band C Coil - Green dot	1
34.	L4 - Band D Coil - White dot	1
35.	L5 - Bands E,F and G Coils Yellow dot	1
36.	Audio Choke	1
37.	Connector Jacks	2
38.	Shielded cable	1
39.	Pilot light assembly	1
40.	Pilot light bulb	1
41.	Line cord	1
42.	3/8" Panel Washers	2
43.	3/8" Nuts	3
44.	Bare stiff wire	1
45.	3/8" Star lock washers	5
46.	#6 Self tapping screws	9
47.	10 - 24 Handle screws	2
48.	6 - 32 1/4" screws	9
49.	#4 Air trimmer screws	2
50.	6-32 Nuts	16
51.	3/8 Rubber grommets	3
52.	Ground lugs	5
53.	2 Lug terminal strips	2
54.	Octal sockets	2
55.	Knobs	3
56.	Knob and pointer	1
57.	Roll wire	1
58.	Spagetti	1
59.	Instructions	1
60.	#6 Lock washers	11
61.	#4 Lock washers	2
62.	Pot ground lug	2

R.M.A. RESISTOR COLOR CODE

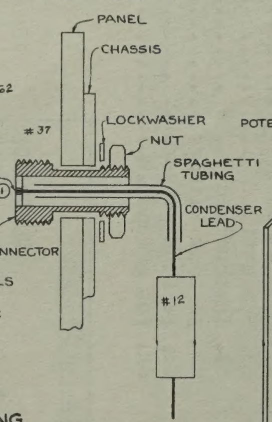
			TOLERANCE
Black -0	Black -0	Black -	Gold = ± 5%
Brown -1	Brown -1	Brown -0	Silver = ±10%
Red -2	Red -2	Red -00	No band = ±20%
Orange -3	Orange -3.	Orange -000	
Yellow -4	Yellow -4	Yellow -0000	
Green -5	Green -5	Green -00000	
Blue -6	Blue -6	Blue -000000	
Violet -7	Violet -7	Gold -Multiply by .1	
Gray -8	Gray -8	Silver -Multiply by .01	
White -9	White -9		

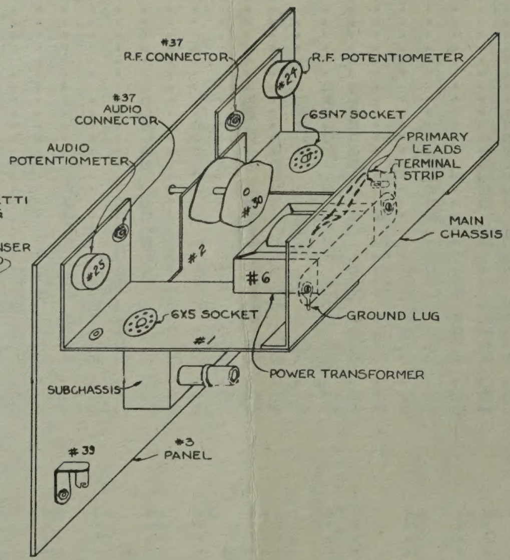


POTENTIOMETER MOUNTING #24 & 25

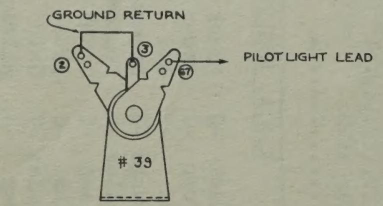


CONNECTOR MOUNTING #37

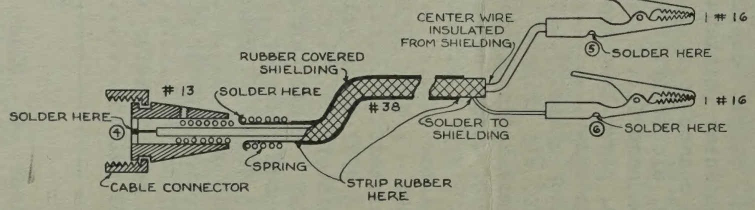




PILOT LIGHT WIRING



COAXIAL CABLE ASSEMBLY



ASSEMBLY PRINT NO. 1

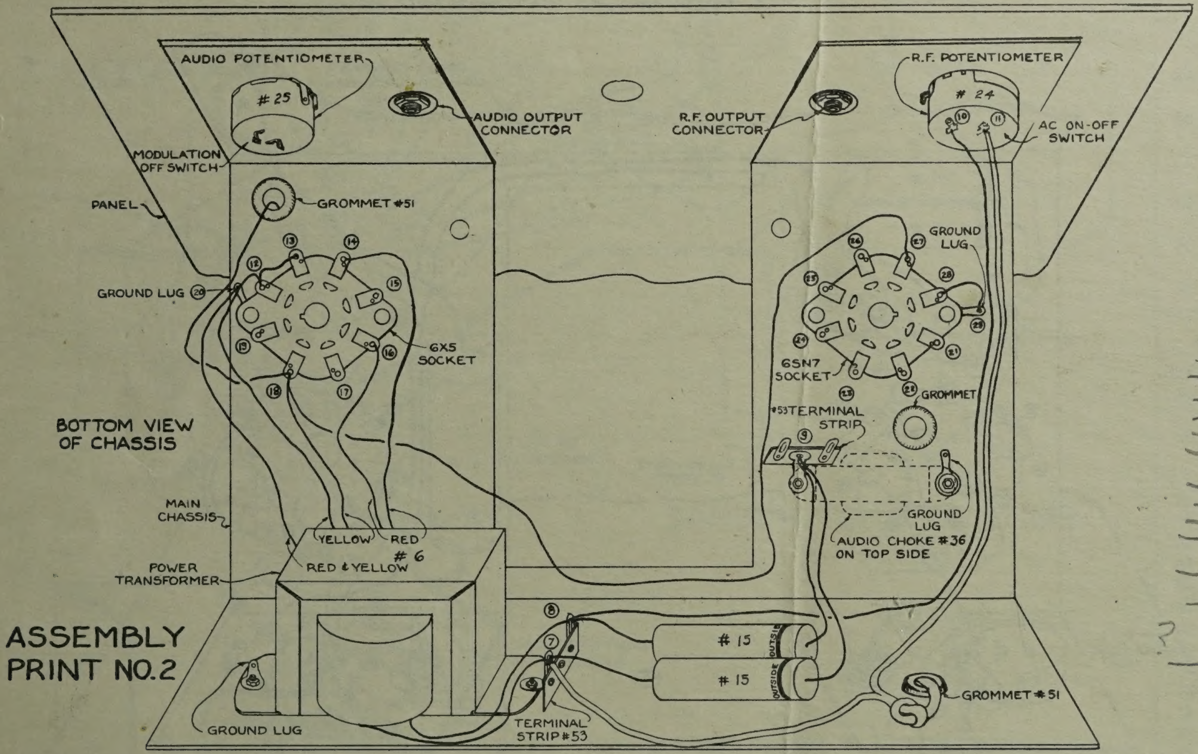
MOUNTING				
STEP NO.	PART #	DESCRIPTION	HARDWARE	REMARKS
1	#25	500K Pot.	1#42,1#43 1#45,1#62	
2	#24	10K Pot.	1#42,1#43 1#45,1#62	
3	#37	Audio Connector	1#45	Nut on Conn.
4	#37	R.F. Connector	1#15	Nut on Conn.
5	#6	Trans.	2#48,2#50 2#60	Mounted with 1#53
6	#39	Pilot light Assembly		

WIRING					
STEP NO.	PART #	DESCRIPTION	FROM	TO	REMARKS
7	#12	.01 Mfd. Condenser	(*71)	①	Spaghetti
8	#12	.01 Mfd. Condenser	(*68)	①	Spaghetti
9	#38	Center of Coaxial Cable	⑤	④	
10	Wire	Hook-up	⑥	Shield	must not short to center
11	#38	Shield of Cable		Spring	

* On Assembly Print No. 3

Circled numbers such as ⑤ represent soldered connections on pictorial diagrams.

ASSEMBLY PRINT NO.2

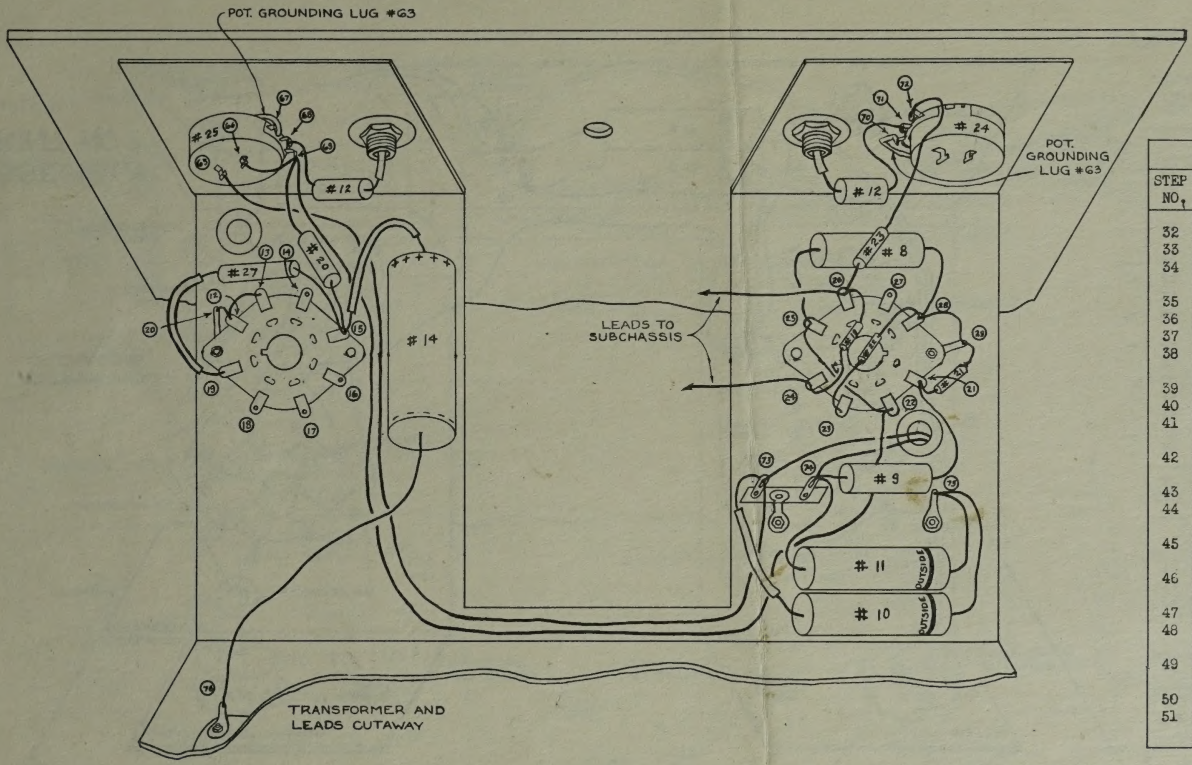


MOUNTING				
STEP No.	PART #	DESCRIPTION	HARDWARE	REMARKS
12	#36	Audio Osc. Choke	2#48, 2#50 2#60	Mounted with 1#52 Lug, 1#53 Term.
13	#51	Grommet	For Pilot Light hole	
14	#51	Grommet	For Audio Choke hole	
15	#51	Grommet	For AC Line hole	

WIRING					
STEP NO.	PART #	DESCRIPTION	FROM	TO	REMARKS
16	Trans	Black lead	Trans	⑦	✓
17	Trans	Black lead	Trans	⑧	✓
18	Trans	Red lead	Trans	⑯	
19	Trans	Red lead	Trans	⑭	
20	Trans	Yellow lead	Trans	⑱	
21	Trans	Yellow lead	Trans	⑳	
22	Trans	Red-Yellow lead	Trans	⑳	
23	Wire	Bare	⑳	⑫	
24	Wire	Bare	⑫	⑬	
25	Wire	Hook-up	⑱	*(76)	
26	#15	.1 Mfd. Condenser	⑦	⑨	
27	#15	.1 Mfd. Condenser	⑧	⑨	
28	Wire	Hook-up	⑧	⑩	
29	#41	Line cord	Line	⑦	Knotted
30	#41	Line cord	Line	⑪	Knotted
31	Wire	Hook-up	⑱	㉗	

*On Assembly Print No. 1 and 5

Circled numbers such as ⑦ represent soldered connections on pictorial diagrams.

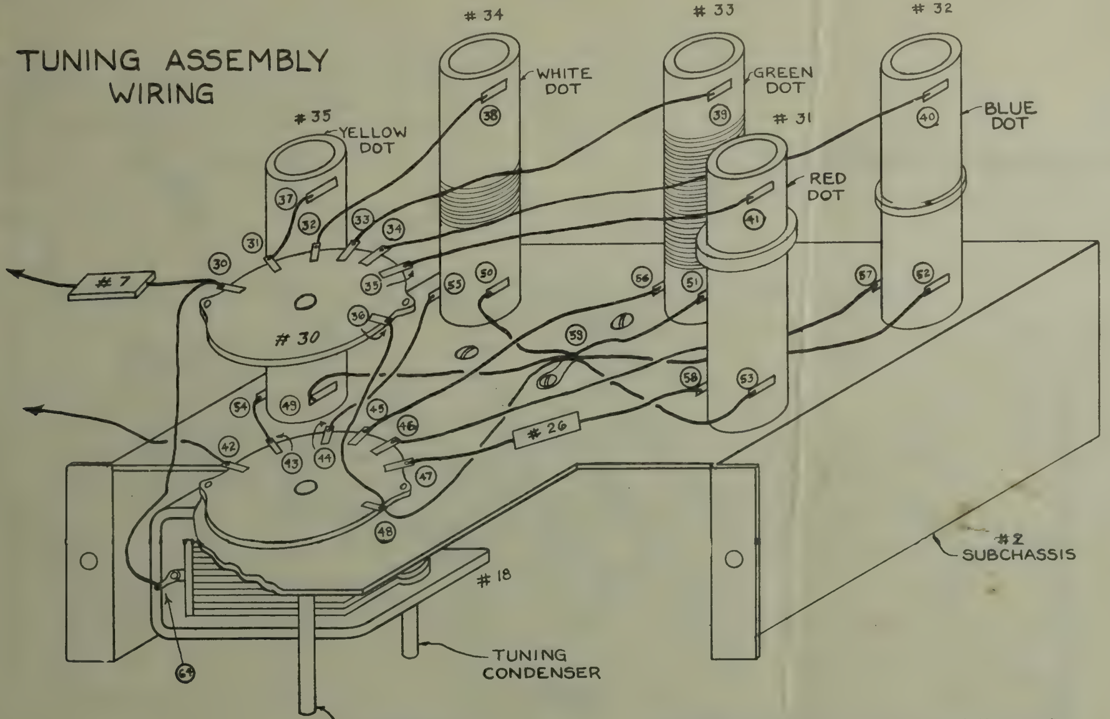


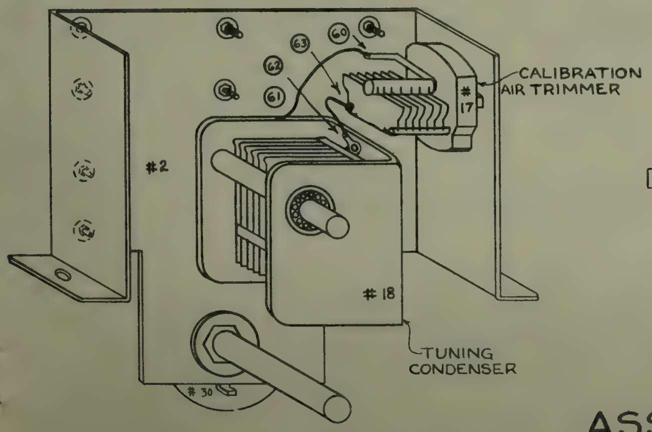
ASSEMBLY PRINT NO. 3

WIRING					
STEP NO.	PART #	DESCRIPTION	FROM	TO	REMARKS
32	#62	Pot Gnd Lug	Gnd	(70)	✓
33	#62	Pot Gnd Lug	Gnd	(67)	✓
34	#8	.002 Mfd. Condenser	㉕	㉘	
35	Wire	Bare	㉘	㉙	
36	#21	65K Res.	㉙	㉑	
37	Wire	Hook-up	㉕	㉒	
38	#22	20 ohm Resistor	㉓	㉘	
39	#19	100K Res.	㉔	㉖	
40	#23	10K Res.	㉖	(72)	
41		Audio Choke Lead	Choke	(73)	
42		Audio Choke Lead	Choke	(74)	
43	Wire	Hook-up	㉒	(69)	
44	#9	.05 Mfd. Condenser	㉑	(74)	
45	#11	.50 Mfd. Condenser	(75)	(74)	
46	#10	.25 Mfd. Condenser	(73)	(75)	Spaghetti
47	Wire	Hook-up	(73)	(65)	
48	#27	5000 ohm Resistor	⑲	⑮	Spaghetti
49	#20	5600 ohm Resistor	⑮	(69)	
50	Wire	Hook-up	(66)	(69)	
51	#14	Electrolytic Cond.	⑮	(76)	Spaghetti

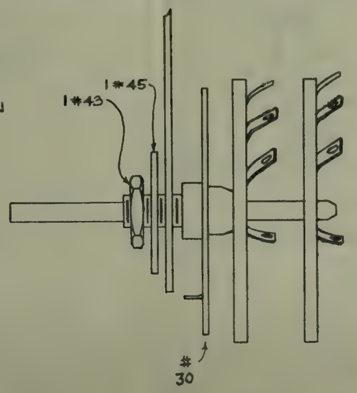
Circled numbers such as (70) represent soldered connections on pictorial diagrams.

TUNING ASSEMBLY WIRING





BANDSWITCH MOUNTING

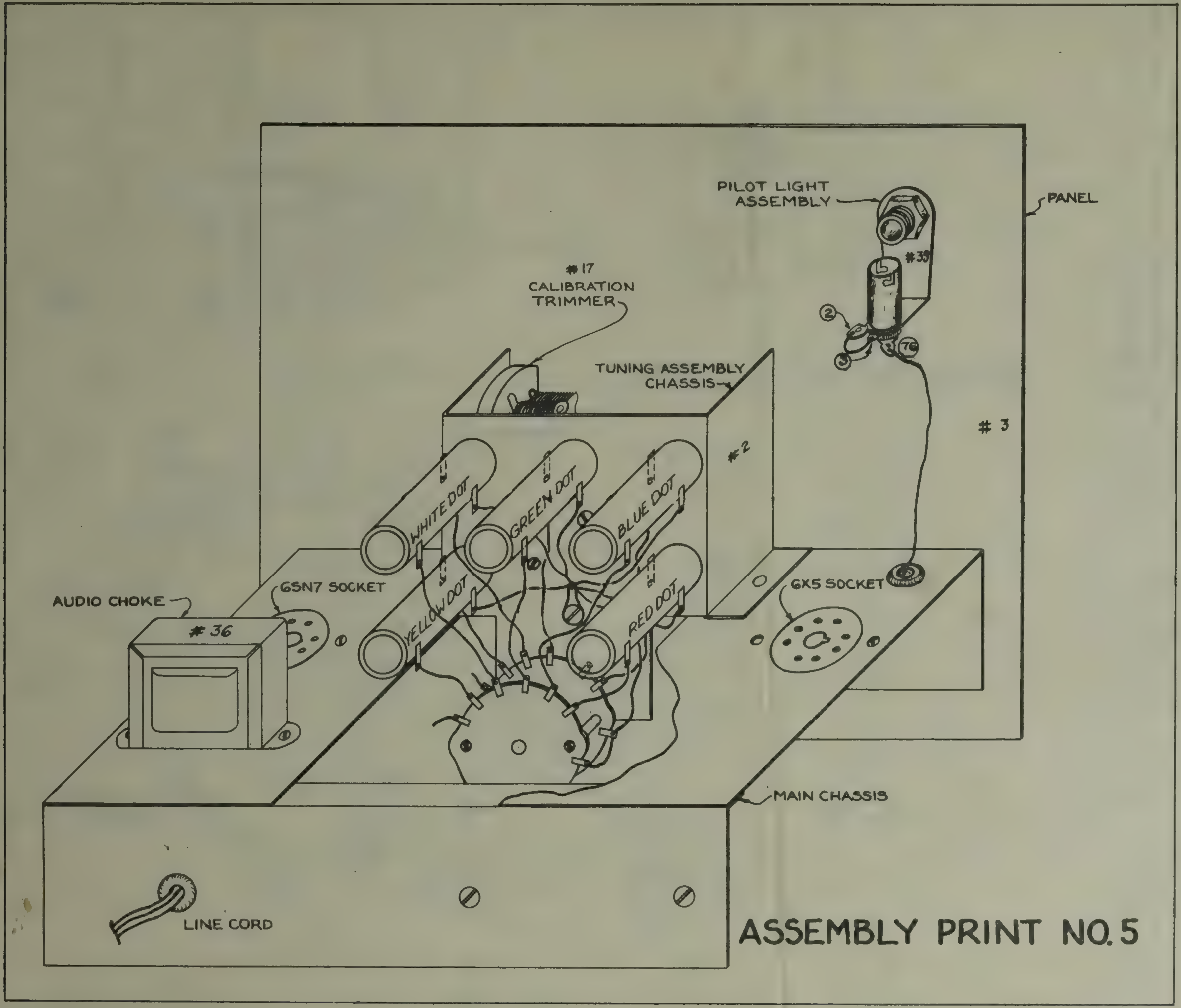


ASSEMBLY PRINT NO.4

MOUNTING				
STEP NO.	PART #	DESCRIPTION	HARDWARE	REMARKS
52	#18	Tuning Cond	3#48,3#60	Mounted with 1#52 Lug
53	#31	Red dot Coil	2#60,2#50	
54	#32	Blue dot Coil	2#60,2#50	
55	#33	Green dot Coil	2#60,2#50	
56	#34	White dot Coil	2#60,2350	
57	#35	Yellow dot Coil	2#60,2#50	
58	#17	Air Trimmer Condenser	2#49,2#61	
59	#30	Bandswitch	1#43,1#45	

WIRING					
STEP NO.	PART #	DESCRIPTION	FROM	TO	REMARKS
60	Wire	Bare-stiff	(60)	(61)	Soldered to Cond. Frame
61	"	" "	(62)	(63)	
62	"	" "	㊾	(59)	
63	"	" "	㊿	(59)	
64	"	" "	(51)	(59)	
65	"	" "	(52)	(59)	
66	"	" "	(53)	(59)	
67	"	" "	㊽	(59)	
68	"	" "	㊸	(54)	
69	"	" "	㊹	(55)	
70	"	" "	㊺	(56)	
71	"	" "	㊻	(57)	
72	"	" "	㊱	㊽	
73	#26	2700 ohm Resistor	㊼	(58)	
74	Wire	Bare-stiff	㉛	㊲	
75	"	" "	㉜	㊳	
76	"	" "	㉝	㊴	
77	"	" "	㉞	㊵	
78	"	" "	㉟	㊶	
79	Wire	Hook-up	㉚	(64)	

Circled numbers such as (60) represent soldered connections on pictorial diagrams.



ASSEMBLY PRINT NO.5

MOUNTING

STEP NO.	PART #	DESCRIPTION	HARDWARE	REMARKS
80	#2	Wired Subchassis	2#60 2#48,2#50	

WIRING

STEP NO.	PART #	DESCRIPTION	FROM	TO	REMARKS
81	Wire	Bare	②	③	
82	Wire	Hook-up	㊷*	㉖*	
83	#7	50 Mmfd Mica Cond.	㉚*	㉔*	

MOUNTING

STEP NO.	PART #	DESCRIPTION	HARDWARE	REMARKS
84	#5	Handle	2#47	
85	#4	Cabinet	9#46	After testing Sig. Gen.

*On Assembly Print Nos. 3 and 4

Circled numbers such as ② represent soldered connections on pictorial diagrams.

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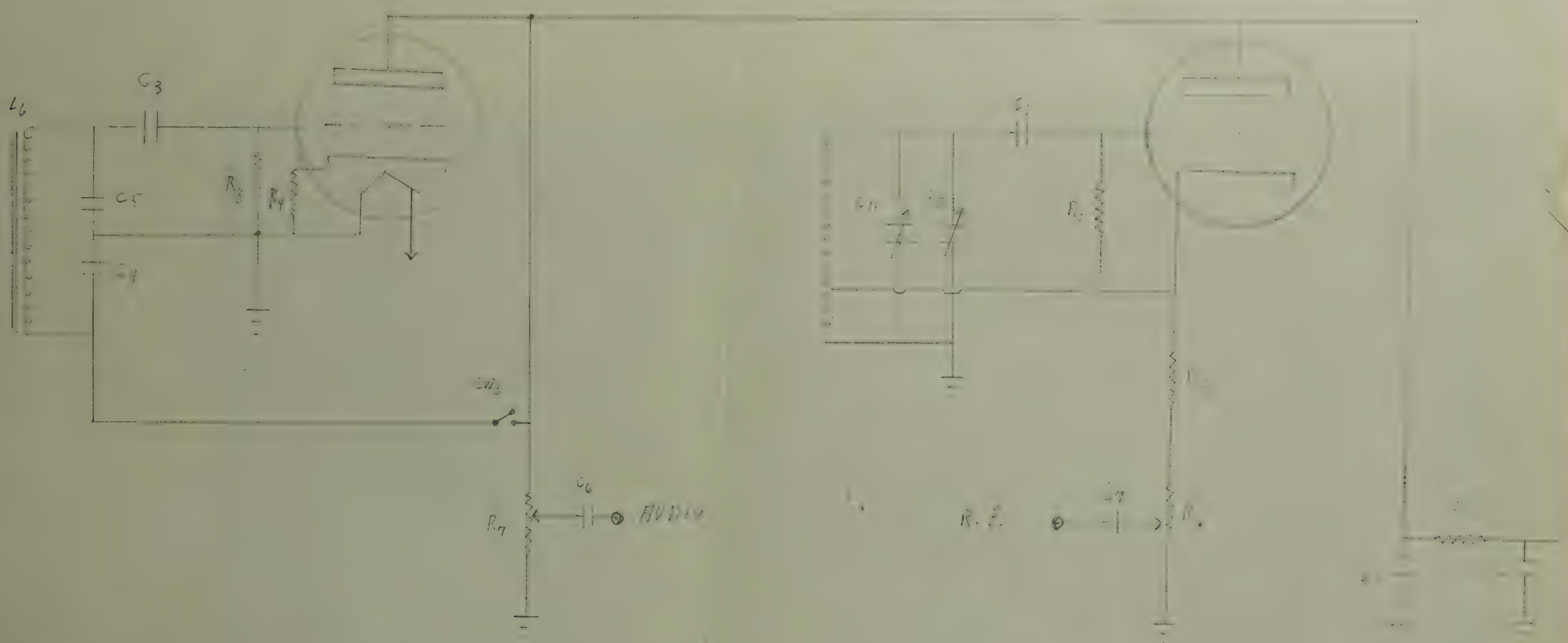
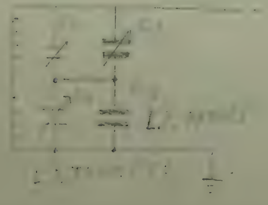
[illegible]


L6
C3
C5
R3
R4
SW3
C6
R7
AUDIO
R.F.


L1

INSTRUCTION MANUAL

FOR

Model 320

SIGNAL GENERATOR

EICO

ELECTRONIC INSTRUMENT CO.
276 NEWPORT STREET
BROOKLYN 12, N. Y.

I-DESCRIPTION

The EICO Model 320 Signal Generator consists of a highly stable Hartly RF Oscillator, covering a frequency range of 150 kc to 34 mc, with strong harmonics to 102 mc. This entire range is calibrated on the dial in seven (7) ranges. The RF Oscillator is ½ of a 6SN7 tube. Variable output is taken from the cathode. The other half of the 6SN7 is a colpitts type audio oscillator providing 400 cycle pure sine wave output which is also utilized to modulate the RF oscillator. An attenuator provides variable audio voltage.

2-GENERAL OPERATING INSTRUCTIONS

Before using the EICO Model 320 Signal Generator, read the instructions very carefully. The EICO Model 320 Signal Generator is designed to operate on 105 to 120 volts, 50-60 cycle alternating current. The AC power switch is located on the RF attenuator control. For best accuracy, the unit should be allowed to warm up at least 15 minutes before making any alignments. The controls and output connectors are clearly identified by the makings on the panel and serve the following purpose.

1. *BANDSWITCH:* RF oscillator range selector which selects frequencies from 150 kc to 102 mc. Bands E, F, and G are on the same switch position.

2. *R.F. ATTENUATOR:* Adjusts strength of RF signal delivered to RF output connector. When turned to the extreme counter-clockwise position, signal generator is turned off.

3. *AUDIO ATTENUATOR:* Adjusts strength of 400 cycle audio voltage delivered to audio output connector. When turned to the extreme counter-clockwise position, the audio oscillator is turned off and the RF signal is unmodulated.

4. *RF OUTPUT:* Connect coaxial cable supplied with the instrument for either modulated or unmodulated signals. *NOTE:* Put ground lead of coaxial cable to B- of receiver, which is not necessarily the chassis, depending upon the particular model. Do not confuse the RF

output connector with the audio output connector.

5. *AUDIO OUTPUT:* For 400 cycle audio signal, connect coaxial cable to audio output connector.

3-MICRO-CYCLE VERNIER TUNING

USE OF ADDITIONAL 0-100 REFERENCE SCALE - When certain applications of the signal generator require constant resetting to particular frequency, it will be advantageous to remember the setting on the 0-100 reference scale and set the pointer accordingly.

4-ALIGNMENT OF AM RECEIVERS

Modern Radio Receivers employ from two up to eight, ten or even more circuits to achieve the selectivity desired.

These circuits, however, are of little benefit unless all of them are working at their proper frequencies simultaneously. Only someone acquainted with the alignment of Receivers in a Radio Production Department, or someone engaged in Radio Service work who has adjusted a Receiver on which someone has tightened all of the adjusting screws, can realize how dead a Receiver can sound when all of its tuned circuits are out of adjustment any considerable extent. The purpose of aligning a Receiver is two-fold to adjust it for maximum performance, and to make the dial indicate to within two or three per cent the frequency of the station being received. Since a trimmer adjustment is more sensitive when the circuit capacity is low, the trimmer adjustment is usually made near the high-frequency end of the tuning range. If the adjustment is made at the very end of the range, the maximum mistracking over the adjacent portion of the band will be greater than if an alignment point is chosen some small distance from the extreme high-frequency end of the tuning range. In the broadcast band, 1400 K.C. is usual choice and is the frequency recommended as standard by the Institute of Radio Engineers. On short-wave band on the same receiver, it is a good practice to align them at the same position on the gang condenser. Most manufacturers give the correct alignment information in the Receivers instruction book.

DUMMY ANTENNA - In order to make allowance for the effects that the outside antenna will have on the alignment of the Receiver, a substitute for the antenna called a dummy antenna representing the average antenna is used to connect the Signal Generator to the Antenna connection of the Receiver. For receiver frequency ranges up to 1700 K.C. the average antenna is essentially a capacity of 200 Micromicrofarads, if used on a high inpedance primary. On frequencies above 1700 K.C. the average antenna can be represented by a 400 ohm carbon resistor.

TRF RECEIVERS - On a TRF Receiver, all tube circuits operate simultaneously at one frequency. Aligning a factory built receiver having a dial calibration to match the coils and condensers used, the dial is set to indicate the frequency at some signal of known frequency and the individual circuit adjusted to maximum performance on the signal at that setting of the condenser.

SUPER-HETERODYNE RECEIVERS - On a Super-Heterodyne Receiver, circuits must operate at three different frequencies, properly related, if satisfactory performance is to be obtained. Beginning with the circuit closest to the output tubes, the intermediate-frequency circuits must all operate at the same frequency in order to give satisfactory amplification. Actually they will work over a wide frequency range, but if they are operated very far from the intermediate frequency specified for the given dial, coils and tuning condensers, the dial indication will be in error more than the customary few percent and, in the case of Receivers employing special cut tracking plates in the Oscillator condensers, serious mistracking of the Oscillator with other tuned circuits will result, producing a loss in sensitivity and reduction in image-ratio.

I. F. ALIGNMENT - The first adjustment on a Super-Heterodyne Receiver is to align the intermediate-frequency amplifier at the correct frequency. The transformer should be adjusted to give the strongest signal by adjusting, in turn each of the adjustments on all of the I. F. transformers. The intermediate frequency stages should be aligned first and in their reversed order, starting at the stage immediately preceding the second detector. For this procedure the coaxial cable is connected to the grid of the tube preceding the stage under alignment, and the ground clip to the Receiver ground. Since it is essential that the operating characteristics of a stage should not be altered, this connection to the grid should be made with the grid lead in place. This procedure should be continued until all of the IF transformers have been aligned properly. When the alignment of the IF amplifier is completed, alignment of the RF and oscillator circuits should be made.

OSCILLATOR ALIGNMENT - Connect the appropriate dummy antenna between the high side of the Signal Generator output and the antenna connection of the Receiver, and set the frequency of the Signal Generator to an appropriate frequency on the band to be aligned, this is usually about 80% of the maximum frequency tunable on that band - set the Receiver dial to the corresponding frequency. Turn the volume and sensitivity controls of the Receiver full on; now turn the Generator attenuator to high output and adjust the Oscillator trimmer until a signal is heard. Reduce the signal from the Signal Generator as alignment proceeds, always using as little input as possible because weak signals permit a more accurate alignment than strong signals. Care should be taken that the alignment condenser and not the series padding condenser be used for this adjustment.

RF AND ANTENNA ALIGNMENT - Next align the RF Amplifier circuit. On the band below 6 megacycles the frequency of the RF amplifier circuit has very little effect upon the Oscillator frequency, but at higher frequencies the adjustments of the RF circuit have a slight effect upon the frequency of the Oscillator; consequently it is necessary, when aligning a high-frequency RF amplifier, to ROCK the gang condenser very slightly as the alignment proceeds to be sure that a shift in Oscillator frequency has not shifted the Heterodyne signal out of range of the IF amplifier. The Antenna circuit is then aligned in the conventional manner.

OSCILLATOR PADDING - Shifting the tuning dial to a point about 10% up from its lowest frequency, the Oscillator circuit should be padded for best tracking with the Antenna and RF circuits. If the Radio Set is sufficiently sensitive to produce a readily discernable hiss in the speaker, the easiest way to pad the Oscillator circuit is to adjust the padding Condenser for maximum hiss or minimum noise. When this point is padded it is well to turn to the high frequency end and re-align that part of the band.

5-ALIGNMENT OF FM RECEIVERS

The first step is to align the primary and secondary trimmers of the discriminator transformer. To do this connect the output cable of the signal generator between grid and ground the limiter tube. If two limiter tubes are used the signal generator is connected across the grid circuit of the second limiter tube. The VOM is now connected across both cathodes of the discriminator. A VTVM may also be used for this purpose. With the signal generator set for an unmodulated signal at the IF frequency specified by the mnnufacturer, the Primary trimmer is first adjusted for Maximum output on the indicating meter. Following this the Secondary trimmer is adjusted for minimum output on the meter scale. It may be found that when adjusting the secondary three positions of the trimmer will result in a minimum reading. The correct position is the one where a slight rotation of the trimmer in either direction of the minimum position increases the meter reading.

The VOM is now connected in series with the ground return of the grid resistor of the limiter, with the instrument set at the most suitable microamp range. If a VTVM is used the meter is connected across this grid resistor, using the lowest scale that will render satisfactory readings. The IF trimmers of the various stages are now aligned for maximum output starting with the last IF stage and proceeding to the first as in the conventional superheterodyne. The setting of the signal generator must not be disturbed from the original position of the dial setting where the original discriminator adjustments were made.

In some receivers it will be found that the IF transformers are overcoupled to obtain a broad bandpass characteristic. When aligning this type of IF transformer it will be found that two consecutive peaks are obtained when each trimmer is rotated. The procedure in this case is to adjust each trimmer for a dip between these peaks. This occurs when both adjustments result in the same output meter readings. It is advisable at this point to repeat all the foregoing adjustments, starting with the discriminator and ending with the first IF. This is to insure symmetry of response in the discriminator and in the IF stages.

In order to check response symmetry in the IF stages, the signal generator is shifted 50 to 100 kc on each side of resonance, at the same time observing the grid current in the limiter stage. Symmetrically aligned IF transformers will give fairly equal but opposite readings for equal and opposite frequency deviations from resonance. The linearity of the discriminator is checked in a similar manner, the voltmeter being connected now across both diodes of the discriminator.

ALIGNMENT OF FM OSCILLATOR CIRCUIT - The alignment of the oscillator and RF trimmers is conventional. The signal generator is set at approximately 100 mc. and the receiver dial to this same setting. Then, with the output indicating meter connected in the grid circuit of the limiter, the oscillator and RF trimmers are tuned consecutively for maximum output.

It will be observed that the procedure varies insofar as the discriminator transformer is first detuned, thereby permitting all adjustments to be observed on the meter connected across the diode cathode connections of the discriminator. This is a timesaving procedure. Notice that the final adjustment is made on the discriminator transformer.

FM RATIO DETECTOR ALIGNMENT - The alignment of FM receivers employing ration detectors.

Equipment necessary: RF Signal Generator and VTVM

1. Connect VTVM from ground to audio lead of radio detector (discriminator). Connect generator tuned to 10.7 mc to grid of third FM i-f tube through .01 mfd capacity. Use minimum signal necessary for good indication in all following:

2. Turn secondary slug of ratio detector transformer (top slug) out as far as it will turn.

3. Tune primary for maximum output.

4. Connect generator to grid of second FM i-f tube.

5. Tune primary and secondary of third FM i-f transformer for maximum output.

6. Connect generator to grid of first FM i-f tube.

7. Tune primary and secondary of second FM i-f transformer for maximum output.

8. Connect generator to converter grid through 10,000 ohm resistor and .1 mfd. capacitor.

9. Tune primary and secondary of first FM i-f transformer for maximum putput.

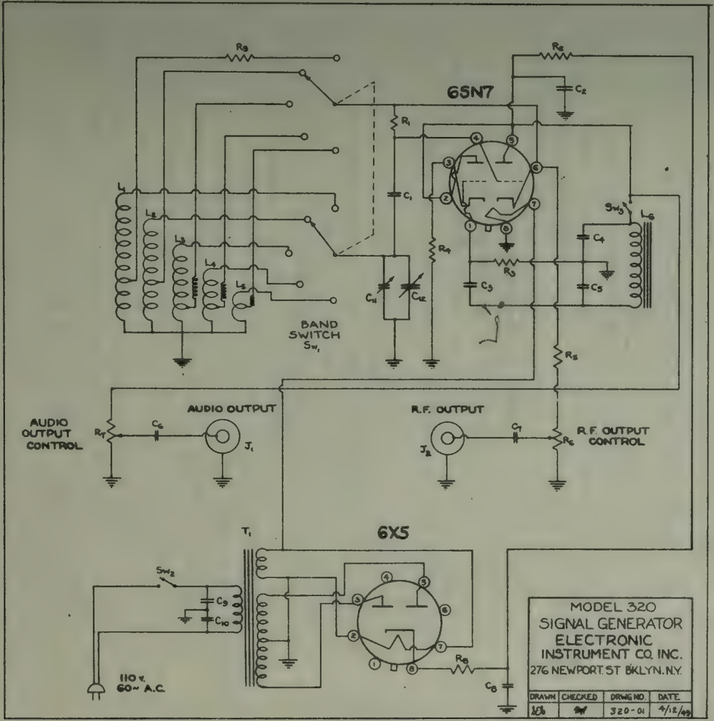
10. Tune secondary of ration detector transformer for zero of minimum output.

11. After all adjustments, the signal generator should be tuned 50-100 kc on each of 10.7 mc. If equal deflections of opposite polarity on the VTVM are shown, the 1-f system is aligned. Deflections ununequal by more than 10% or so indicate inaccurate alignment.

* § *

GUARANTEE

This instrument is guaranteed to be free from defects in material and workmanship in accordance with the terms of the Standard RMA Warranty.



MODEL 320
SIGNAL GENERATOR
ELECTRONIC
INSTRUMENT CO. INC.
276 NEWPORT ST. BKLYN. N.Y.

DRAWN	CHECKED	DRWG NO.	DATE
[illegible]	[illegible]	320-01	4/12/49

ITEM	PART #	SPECIFICATION
R1	19	100 K RESISTOR
R2	20	5600 OHM RESISTOR
R3	21	65 K RESISTOR
R4	22	20 OHM RESISTOR
R5	23	10 K RESISTOR
R6	24	10 K POT WITH SWITCH
R7	25	500 K POT WITH SWITCH
R8	27	5000 OHM RESISTOR
R9	26	2700 OHM RESISTOR
C1	7	50 MMF MICA COND.
C2	8	.002 MFD. COND.
C3	9	.05 MFD. COND.
C4	10	.25 MFD. COND.
C5	11	.50 MFD. COND.
C6	12	.01 MFD. COND.
C7	12	.01 MFD. COND.
C8	14	16 MFD. OR OVER ELECTROLYTIC
C9	15	.1 MFD. COND.
C10	15	.1 MFD. COND.
C11	17	50 MMFD AIR TRIMMER
C12	18	360 MMFD TUNING COND.
T1	6	POWER TRANSFORMER
SW1	30	BANDSWITCH
SW2	24	PART OF R6
SW3	25	PART OF R7
L1	31	BAND A COIL - RED DOT
L2	32	BAND B COIL - BLUE DOT
L3	33	BAND C COIL - GREEN DOT
L4	34	BAND D COIL - WHITE DOT
L5	35	BAND E, F, G, COIL YELLOW DOT
L6	35	AUDIO OSCILLATOR CHOKE